MANAGER'S BUDGET ADDENDUM #7

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Memorandum

TO: HONORABLE MAYOR AND CITY COUNCIL

FROM: James R. Helmer
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SUBJECT: **NEW STREETLIGHT TECHNOLOGY**

DATE: 05-17-04

Approved /s/ Date

In the Mayor's March 17, 2004 Budget Message, the Mayor emphasized the need to continue to find creative solutions to provide transportation infrastructure and services despite the difficult budget situation. The City Manager was directed to evaluate implementing new energy efficient streetlight technology that can reduce General Fund costs. The purpose of this memorandum is to provide the Mayor and City Council with current information regarding new streetlight technology evaluation and implementation.

There are two types of streetlights utilized by the City: High Pressure Sodium (HPS) and Low Pressure Sodium (LPS). HPS streetlights are the lights installed throughout Downtown. Although HPS is not the most efficient among traditional streetlighting technologies, it produces an amber-white light that creates a livelier, more color accurate environment desired in Downtown. LPS streetlights produce an orange-yellow light and are used in the majority of the residential areas and arterial roadways outside Downtown. They are installed throughout the City because they are the most energy efficient among traditional lighting technologies, requiring fewer fixtures in the street, and they do not interfere with telescopes at the Lick Observatory. The table below provides an approximate breakdown of the lighting installations in San José.

Type	Wattage	Quantity	% of Inventory	Application
HPS	70-150	2,500	5%	Downtown
HPS	70-150	2,000	4%	Arterial streets outside Downtown *
HPS	200-400	500	1%	Downtown
HPS	200-400	1,000	2%	Arterial streets outside Downtown *
LPS	55	30,000	54%	Residential areas outside Downtown
LPS	90-180	20,000	34%	Arterial streets outside Downtown
		56,000	**100%**	

* There are some HPS lights installed on arterial roads outside downtown in accordance to a 1980 policy requiring HPS. Stevens Creek Blvd is one example location.

While there are very good reasons for how streetlighting technology is implemented in the City, there are new streetlighting technologies emerging that are challenging many of the assumptions and decisions made in the past. Most notably is the emergence of the Light Emitting Diode (LED) streetlighting technology.

Current claims made by LED streetlight manufactures are that LED technology offers 50-70% reductions in energy costs and virtually no routine maintenance costs for 10 years or more. The assertion regarding energy savings is based on the theory that the light delivered from LED technology is capable of allowing better visibility with less actual light output, therefore requiring less energy consumption. Several companies are sharing this information with municipalities and describing how a LED streetlight retrofit project can produce significant overall savings in approximately ten years or less. As a result of these claims and the successes of LED technology in traffic signals, lighted signs, and other transportation related devices, City staff have performed an initial investigation of LED streetlighting technology and its potential application in San José.

City staff concurs that virtually no routine maintenance would be required on an LED Streetlight for 10 or more years. This has been a proven characteristic of LED technology. However, regarding the claim that the light generated by an LED streetlight provides equal or better vision than any of its counterparts, there is currently no conclusive research or declarations made by the streetlighting industry that confirm this is accurate, although thorough research is underway.

In terms of the claim that LED technology is the most energy efficient streetlighting available, City staff believes that this is not the case. One way to measure the energy efficiency of a light is to compare the amount of light it produces to the power it consumes. The amount of light produced by a streetlight is quantified in lumens and the amount of power consumed is quantified in watts. The energy efficiency would be calculated by dividing lumens by watts (lumens per watt). The table below describes the lumens produced by various streetlights used in the City and the calculated energy efficiency. It also describes the number of LED streetlights that would be required to achieve the same lighting levels for each existing City streetlight.

	LED	**HPS**		**LPS**	
	36 watt	**70 watt**	**150 watt**	**55 watt**	**135 watt**
Typical Light Output - (In Lumens)	1,100	5,800	16,000	8,000	22,500
Energy Efficiency - (Lumens per watt)	30	58	84	94	128
* Number of LED lights needed to achieve about the same lighting level	-	3	6	3	10

* It should be noted that actual lighting levels are not based on lumens alone. The way a fixture is designed to reflect, focus, and distribute lumens of light generated by the lamp is analyzed and used to determine required fixture quantities for specific levels of light on the street. Taking into account these factors lowers the number of LED fixtures required.

As indicated, a typical 36-watt LED streetlight that generates 1,100 lumens is less energy-efficient than the rest of the lights. It is also apparent that it produces much less light, and therefore, to achieve existing lighting levels on developed streets, or to achieve City standard lighting levels for new developments, several more times the number of lights would need to be installed, resulting in much more energy consumption.

Regarding costs, a one-for-one replacement of certain existing HPS and LPS locations to LED streetlights would generate overall savings in some instances, but provides a fraction of the current lighting level. The table below compares individual LED streetlight costs over a ten-year period to the types of streetlights used in San José.

	LED	**HPS**		**LPS**	
		70 watt	**150 watt**	**55 watt**	**135 watt**
LED Retrofit Cost	$500	$0	$0	$0	$0
Energy Cost	$140	$550	$1,100	$445	$1,000
Maintenance Cost	$0	$120	$185	$115	$180
Total Costs	**$640**	**$670**	**$1,285**	**$560**	**$1,180**

When the 10-year individual streetlight costs are extended to the entire inventory of the same streetlight type and wattage, the overall cost savings from one-for-one replacement of current streetlights with LED streetlights – which would produce a fraction of the current lighting level – are as follows:

Type	**# in City**	**HPS/LPS Cost**	**LED Cost**	**Savings**
70 watt HPS	1,600	$1.072 M	$1.024 M	$48,000
150 watt HPS	2,000	$2.570 M	$1.280 M	$1.290 M
55 watt LPS	30,000	$16.800 M	$19.200 M	– $2.400 M
135 watt LPS	10,000	$11.800 M	$6.400 M	$5.400 M
	Totals:	$32.242 M	$27.904 M	$4.338 M

While cost savings appear to be substantial in some cases, it is important to recognize that this does not consider any costs associated with matching the existing lighting levels, meeting the City's lighting standards for new developments, or meeting National lighting standards. Once conclusive research is performed about the visibility of LED streetlight technology and it is confirmed by the industry that lower light levels still achieve equal or better vision, then the City would consider addressing it standards.

Additionally, LED streetlights generate a broad-colored light spectrum unlike LPS, which is monochromatic, or a single color light output. The importance of this fact is that the Lick

Observatory relies upon the City's use of LPS streetlighting to reduce sky glow and effectively utilize its telescopes. The single colored light produced by LPS streetlights can be easily filtered out by the observatory and minimize its interference with viewing. The broad-colored light spectrum created by LED technology is difficult to filter and would significantly impact operations at the observatory. Any changes to the City's LPS streetlights would require full coordination with the observatory.

Finally, staff investigated the use of LED streetlight technology in other Cities. At this time, very small tests are being performed in a few cities, including Rohnert Park, Oakland, and Monrovia. Staff intends to remain in contact with these cities and continue to search for other implementations of LED streetlight technology.

City staff believes that LED streetlighting technology is promising. However, based on the research recently done it was concluded that LED streetlighting technology is not appropriate for use in San José at this time for the following reasons:

- LED technology cannot produce enough light output to be considered a viable, cost-effective replacement for existing City streetlights at this time.

- The light created by LED streetlights would be detrimental to the Lick Observatory if implemented on a large scale.

Nonetheless, it is recommended that staff continue to monitor the advancements made in the industry, stay in contact with cities that are testing or implementing the technology, and look for opportunities to perform tests and pilot projects in San José.

/s/ /s/

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